N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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Research Design

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## Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality

A ➔ B
Pressure ➔ Ulcer

Multicausality

Years smoking ➔ Heart disease
High fat diet ➔ Heart disease
Limited exercise ➔ Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

- Yes
- No

Is the primary purpose examination of relationships?

- No
- Yes

No

Is the treatment tightly controlled by the researcher?

- Yes
- No

No

Will the sample be studied as a single group?

- No
- Yes

No

Will a randomly assigned control group be used?

- Yes
- No

No

Is the original sample randomly selected?

- Yes
- No

No

Descriptive Design

Quasi-Experimental Study

Experimental Study

Correlational Design
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Data collected across time
        - No
          - Cross-sectional design
        - Yes
          - Studying events partitioned across time?
            - No
              - Trend Analysis
            - Yes
              - Repeated measures of each subject
                - Yes
                  - Longitudinal Study
                - No
                  - Case Study

- Single unit of study
  - Yes
    - Longitudinal design with treatment partitioning
A Typical Descriptive Design

<table>
<thead>
<tr>
<th>Clarification</th>
<th>Measurement</th>
<th>Description</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenomenon of Interest</td>
<td>Variable 1</td>
<td>Description of Variable 1</td>
<td>Interpretation of Meaning</td>
</tr>
<tr>
<td></td>
<td>Variable 2</td>
<td>Description of Variable 2</td>
<td>Development of Hypotheses</td>
</tr>
<tr>
<td></td>
<td>Variable 3</td>
<td>Description of Variable 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Variable 4</td>
<td>Description of Variable 4</td>
<td></td>
</tr>
</tbody>
</table>
A Comparative Descriptive Design

Group I
:variables measured

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Development of Hypotheses

Group II
:variables measured

Describe

Research Design
Selecting the Type of Correlational Design

Describe relationships between/among variables?
- Descriptive correlational design

Predict relationships between/among variables?
- Predictive correlational design

Test theoretically proposed Relationships?
- Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Description of variable

Research Variable 2
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
    - Pretest?
      - No
        - One-group post-test only design
      - Yes
        - Comparison with population values?
  - Yes
    - Pretest?
      - No
        - Repeated Measures?
          - No
            - Strategy for Comparison
          - Yes
            - Suggest reevaluating design
      - Yes
        - Compare treatment & control conditions?

Research Design
Selecting The Type of Experimental Design

- Pretest
  - No
  - Post-test only control group design
  - Yes
  - Repeated Measurements?
    - No
    - Examine effects of confounding variables?
      - No
      - Multiple sites?
        - No
        - Pretest/post-test control group design
        - Yes
        - Randomized clinical trials
          - No
          - Comparison of multiple levels of treatment
            - No
            - Examination of complex relationships among variables in relation to treatment
            - Yes
            - Nested Designs
          - Yes
          - Randomized Block Design
## Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Randomly selected experimental group</strong></td>
<td>PRETEST</td>
</tr>
<tr>
<td><strong>Randomly selected control group</strong></td>
<td>PRETEST</td>
</tr>
</tbody>
</table>

### Treatment:
- Under control of researcher

### Findings:
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

### Example:
Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

### Uncontrolled threats to validity:
- Testing
- Mortality

### Instrumentation
- Restricted generalizability as control increases
### Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Measurement of independent variables</strong></th>
<th><strong>Measurement of dependent variables</strong></th>
</tr>
</thead>
<tbody>
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</table>

<table>
<thead>
<tr>
<th><strong>Treatment:</strong></th>
<th>Under control of researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Findings:</strong></td>
<td>Comparison of experimental and control groups</td>
</tr>
<tr>
<td><strong>Uncontrolled threats to validity:</strong></td>
<td>Instrumentation</td>
</tr>
<tr>
<td></td>
<td>Mortality</td>
</tr>
<tr>
<td></td>
<td>Limited generalizability as control increases</td>
</tr>
</tbody>
</table>
# Nested Design

## Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

## Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
</tr>
<tr>
<td>Unit E</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit G</td>
<td>Unit H</td>
</tr>
</tbody>
</table>
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design